

eastward to Iceland, and west of the British Isles a track branches southeastward over the Bay of Biscay. An average of less than one storm per month traverses the ocean from coast to coast in May. The average velocity of storms over the north Atlantic Ocean in May and June, 16 statute miles per hour, is the least noted for the year.

The storms of the current month were generally of small intensity. Probably the severest storm of the month occupied the region north of the Banks of Newfoundland on the 1st, with pressure about 29.20 (742) and westerly gales of force 11 east of the Grand Banks. During the 2d and 3d this storm occupied mid-ocean with pressure falling to about 29.00 (736), after which it apparently decreased in energy. During the 6th and 7th low area II passed northeastward over the Gulf of Saint Lawrence and disappeared north of the Banks of Newfoundland. During the 12th and 13th a storm advanced west of north from the region east of the Bahamas, and united with low area IV near the south New England coast. On the 13th a storm appeared over mid-ocean, where it remained nearly stationary until the 16th, attended by pressure ranging from 29.40 (747) to 29.50 (749) and gales of considerable strength. By the 17th this storm had apparently moved southeastward toward the Bay of Biscay, after which it moved slowly northward over the British Isles, and disappeared over the North Sea by the 21st. The morning of the 15th low area IV was central south of Nova Scotia, from which region it moved eastward to the 50th meridian by the 17th, after which it disappeared. On the 19th low area VI passed northeastward over the Gulf of Saint Lawrence. Moving thence north of the Grand Banks this storm advanced rapidly eastward and disappeared north of the British Isles during the 23d, having traversed the ocean in three days. During the 29th low area X passed north of east over the Gulf of Saint Lawrence. The morning of the 29th low area XII occupied the North Carolina coast. From that position the storm moved rapidly northeastward, and at the close of the month had disappeared north of the 55th parallel.

#### OCEAN FOG IN MAY.

The limits of fog belts for May, 1893, as determined from reports of shipmasters, are shown on Chart I by dotted shading. More than the usual amount of fog was encountered

east of the 65th meridian. Near the Banks of Newfoundland fog was reported on 22 days; between the 55th and 65th meridians on 16 days; and west of the 65th meridian on 15 days. Compared with the corresponding month of the last 5 years the dates of occurrence of fog near the Grand Banks numbered 5 greater than usual; between the 55th and 65th meridians 3 greater than usual; and west of the 65th meridian 1 less than usual. The fog in the regions referred to and that noted at regular stations of the Weather Bureau on the middle Atlantic and New England coasts generally attended the approach or passage of general storms.

#### OCEAN ICE IN MAY.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for May during the last 11 years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
May, 1883.....	40 30	47 00	May, 1883.....	45 40	45 12
May, 1884.....	41 30	47 30	May, 1884.....	43 30	44 50
May, 1885.....	40 50	48 15	May, 1885.....	42 30	40 10
May, 1886.....	41 36	51 30	May, 1886.....	48 55	46 13
May, 1887.....	39 38	46 00	May, 1887.....	39 38	46 00
May, 1888.....	41 00	46 00	May, 1888.....	41 00	46 00
May, 1889.....	43 07	55 47	May, 1889.....	49 46	36 48
May, 1890.....	40 50	50 28	May, 1890.....	44 12	36 25
May, 1891.....	40 49	49 07	May, 1891*.....	48 00	45 00
May, 1892.....	42 14	51 20	May, 1892.....	45 05	41 14
May, 1893.....	41 05	55 55	May, 1893.....	47 02	42 16
Mean.....	41 12	49 54	Mean.....	45 02	42 44

\*On the 7th three small pieces of ice were reported in N. 49° 03', W. 33° 40'.

The limits of the region within which icebergs or field ice were reported for May, 1893, are shown on Chart I by ruled shading. The southernmost ice reported, field ice observed on the 14th in the position given, about corresponded with the average southern limit of ice for May, and the easternmost ice reported, 2 medium sized icebergs, noted on the 16th in the position given in the table, was about  $\frac{1}{2}$  degree east of the average eastern limit of ice for the month. Ice was reported in great quantities over the southern and northern parts of the Banks of Newfoundland.

#### TEMPERATURE OF THE AIR (expressed in degrees Fahrenheit).

The distribution of mean temperature over the United States and Canada for May, 1893, is exhibited on Chart II by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperature and the departure from the normal are given for regular stations of the Weather Bureau. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the temperature is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Weather Bureau represents the mean of the maximum and minimum temperatures.

The mean temperature was highest in the Gila, lower Colorado, and lower Rio Grande valleys, where it was above 80, and the mean readings were above 70 south of a line traced from the South Carolina coast to extreme western Texas. The mean temperature was also above 70 over southern and western Arizona and at points in the central valleys of California. The mean temperature was lowest at mountain stations in central Colorado, where it was below 40; at Anticosti Island, Gulf of Saint Lawrence, the mean reading was

39.8. The mean temperature was below 50 in the Canadian Maritime Provinces, over the northern lake region, in the middle and northern Rocky Mountain regions, at points in central and eastern Oregon, northeast California, and on the north Pacific coast.

#### DEPARTURES FROM NORMAL TEMPERATURE.

The month was cooler than usual, except in the British Northwest Territory, New Brunswick, Nova Scotia, on the Massachusetts and Virginia coasts, over Florida, at points on the immediate Gulf coast, and generally in Texas, where the mean temperature was slightly above the normal. The greatest departure above the normal, 2.1, was noted at Chatham, N. B. In the British Northwest Territory the departure was 1 to 2 above the normal. The most marked departure below the normal was reported in the valley of the Columbia River, northern Utah, and central Iowa, where it exceeded 4, and the departure above the normal exceeded 2 from the Pacific coast over the central districts to the middle Atlantic states.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for May for a series of years; (2) the length of record during

which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for May, 1893; (4) the departure of the current month from the normal; (5) and the extreme monthly mean for May during the period of observation and the years of occurrence:

State and station.	(1) Normal for the month of May.	(2) Length of record.	(3) Mean for May, 1893.	(4) Departure from normal.	(5) Extreme monthly mean for May.			
					Highest.	Year.	Lowest.	Year.
<i>Arizona.</i>	0	Years	0	0	0	0	0	0
Fort Apache.....	62.1	21	58.9	- 3.2	67.6	1881	55.6	1884
Fort Mohave.....	80.1	22	78.2	- 1.9	86.8	1875	75.6	1888
Whipple Barracks.....	60.4	22	54.8	- 5.6	68.6	1876	54.3	1892
<i>Arkansas.</i>								
Keesees Ferry.....	67.6	11	65.6	- 2.0	74.4	1886	62.9	1882
<i>California.</i>								
Fort Bidwell.....	54.9	21	50.3	- 4.6	61.8	1881	49.2	1879
Riverside.....	65.4	11	64.9	- 0.5	69.0	1885	60.3	1891
<i>Colorado.</i>								
Las Animas.....	59.6	11	59.2	- 0.4	65.6	1886	54.1	1892
<i>Florida.</i>								
Merritts Island.....	75.7	11	76.6	+ 0.9	79.2	1884	70.3	1886
<i>Georgia.</i>								
Forsyth.....	72.7	19	72.0	- 0.7	75.8	1880	69.2	1877
<i>Idaho.</i>								
Boise Barracks.....	58.5	19	55.1	- 3.4	63.5	1874	53.0	1880
Fort Sherman.....	54.7	10	51.8	- 2.9	57.9	1891	51.5	1882
<i>Indiana.</i>								
Lafayette.....	60.8	13	58.0	- 2.8	69.4	1881	55.0	1882
<i>Indian Territory.</i>								
Fort Supply.....	65.4	14	66.3	+ 0.9	72.1	1886	58.8	1882
<i>Iowa.</i>								
Cresco.....	56.2	21	52.9	- 3.3	64.1	1881	49.9	1888
<i>Kansas.</i>								
Eureka Ranch.....	63.6	10	59.6	- 4.0	69.5	1887	55.0	1892
Independence.....	66.2	21	63.6	- 2.6	72.0	1880	60.8	1872
Salina.....	65.2	10	.....	.....	71.3	1887	58.4	1892
<i>Louisiana.</i>								
Grand Coteau.....	74.2	10	73.4	- 0.8	75.7	1884	70.4	1891
<i>Maine.</i>								
Orono.....	51.7	23	.....	.....	55.9	1887	41.8	1884
<i>Maryland.</i>								
Cumberland.....	61.9	22	61.4	- 0.5	67.0	1880	57.6	1882
<i>Michigan.</i>								
Kalamazoo.....	57.5	16	55.4	- 2.1	66.0	1881	41.3	1882
<i>Missouri.</i>								
Bedalia.....	64.3	10	63.7	- 0.6	69.5	1887	60.1	1882
<i>Montana.</i>								
Fort Custer.....	55.1	11	54.4	- 0.7	58.3	1886	52.2	1888
<i>Nebraska.</i>								
Fort Robinson.....	56.4	9	52.8	- 3.6	66.4	1886	48.9	1892
Genoa (near).....	59.4	17	58.0	- 1.4	67.6	1880	52.2	1892
<i>Nevada.</i>								
Brown.....	65.4	21	60.6	- 4.8	71.3	1889	60.5	1873
Carson City.....	57.0	15	51.3	- 5.7	60.4	1875	51.3	1893
<i>New Hampshire.</i>								
Hanover.....	54.4	22	54.3	- 0.1	62.0	1880	50.2	1882
<i>New Mexico.</i>								
Fort Wingate.....	59.8	22	.....	.....	64.9	1875	54.2	1892
<i>New York.</i>								
Cooperstown.....	54.4	22	52.8	- 1.6	60.7	1880, 1887	49.7	1882
Plattsburg Barracks.....	54.8	22	53.6	- 1.2	60.9	1887	50.3	1882
<i>North Carolina.</i>								
Lenoir.....	62.7	20	63.6	+ 0.9	67.8	1887	48.0	1881
<i>Oklahoma.</i>								
Fort Reno.....	67.3	9	66.7	- 0.6	73.9	1886	64.0	1885
Fort Sill.....	69.8	21	68.0	- 1.8	75.6	1886	64.7	1885
<i>Oregon.</i>								
Bandon.....	54.0	9	50.7	- 3.3	55.8	1891	50.7	1893
<i>Pennsylvania.</i>								
Dyberry.....	54.2	20	54.4	+ 0.2	64.1	1880	48.4	1882
Grampian.....	56.5	22	56.2	- 0.3	65.1	1887	50.0	1882
Wellsboro.....	55.4	14	50.9	- 4.5	68.4	1879	50.4	1891
<i>South Carolina.</i>								
Statesburg.....	70.1	12	69.7	- 0.4	73.8	1881	65.9	1885
<i>South Dakota.</i>								
Fort Sully.....	58.3	22	55.6	- 2.7	68.4	1871	50.6	1892
<i>Texas.</i>								
Austin.....	74.6	18	.....	.....	80.0	1886	72.3	1879
Silver Falls.....	69.9	7	69.2	- 0.7	76.6	1886	65.8	1888
<i>Utah.</i>								
Terrace.....	61.7	21	56.2	- 5.5	71.9	1888	50.6	1882
<i>Vermont.</i>								
Stratford.....	55.2	20	52.6	- 2.6	63.0	1887	48.2	1892
<i>Virginia.</i>								
Dale Enterprise.....	64.1	13	59.5	- 4.6	72.0	1887	59.5	1893
<i>Washington.</i>								
Fort Townsend.....	53.9	21	50.2	- 3.7	57.0	1889	50.2	1880, 1893
<i>West Virginia.</i>								
Parkersburg.....	.....	.....	.....	.....	.....	.....	.....	.....
<i>Wisconsin.</i>								
Embarrass.....	57.4	22	.....	.....	67.5	1880	51.2	1888
Madison.....	56.3	22	53.9	- 2.4	65.3	1881	51.5	1883
<i>Wyoming.</i>								
Fort Washakie.....	51.8	10	49.4	- 2.4	59.2	1886	47.6	1892

#### TEMPERATURE, JANUARY TO MAY, 1893.

For the period January 1 to May 31, 1893, the mean temperature averaged 3 to 4 below the normal in the upper Mis-

issippi valley and over the middle and northern plateau regions, and was 2 to 3 below the normal in the middle Atlantic and New England states, the Lake region, the Missouri Valley, on the northeast and middle-eastern slopes of the Rocky Mountains, and over the north and middle Pacific coasts. In the south Atlantic and east Gulf states, at Key West, Fla., over the southern plateau region, and on the south Pacific coast the mean temperature was about 1 below the normal. On the southeast slope of the Rocky Mountains the temperature averaged 1 to 2 above the normal, and in the west Gulf states and the extreme northwest it averaged about 1 above the normal for the period named.

#### YEARS OF HIGHEST MEAN TEMPERATURE FOR MAY.

The highest mean temperature for May occurred in Washington in 1889; in Oregon in 1888; over the southern plateau region and on the southeast slope of the Rocky Mountains in 1886; in the Sacramento Valley and on the south Pacific coast in 1885; in the upper and lower Mississippi and middle Ohio valleys in 1881; and in the middle Atlantic and New England states, the Lake region, a great part of Kentucky and Tennessee, and in Arkansas and the lower Missouri valley in 1880.

#### YEARS OF LOWEST MEAN TEMPERATURE FOR MAY.

At Dale Enterprise, Va., Lexington, Ky., Carson City, Nev., Eureka, Cal., Bandon and Portland, Oregon, and Walla Walla, Fort Townsend, Fort Canby, and Neah Bay, Wash., the mean temperature for the current month was the highest noted during the respective periods of observation. The lowest mean temperature for May occurred generally from the middle and lower Missouri and Red River of the North valleys over the northern plateau region and eastern parts of the middle and southern plateau regions in 1892; in the middle Atlantic and New England states, the eastern lake region, and in Tennessee and the Ohio and middle Mississippi valleys in 1882.

#### MAXIMUM TEMPERATURE.

The highest temperature reported by a regular station of the Weather Bureau for May, 1893, was 104, at Yuma, Ariz., on the 31st, and a reading of 103 was noted at Abilene, Tex., on the 30th. The maximum temperature rose above 90 over the Florida Peninsula, the interior of the Gulf States, and at points on the northeast and southeast slopes of the Rocky Mountains. At Miles City, Mont., a maximum of 98 was registered on the 17th. The maximum readings were also above 90 in the central valleys of California. The lowest maximum temperature was reported along the immediate Pacific coast north of the 40th parallel, where it was below 70, and the maximum values were below 80 on the east Maine, southeast New England, and the New Jersey coasts.

#### MINIMUM TEMPERATURE.

At Dodge City and Concordia, Kans., and Cheyenne, Wyo., the minimum temperature noted on the 1st and 2d was the lowest reported for May during the respective periods of observation.

The lowest temperature reported by a regular station of the Weather Bureau for May, 1893, was 20, at Cheyenne, Wyo., on the 1st. The minimum values were below 30 in the Lake Superior region, the middle and northern Rocky Mountain regions, and in southern Idaho, eastern Oregon, and northern Nevada. The minimum temperature was below 40 north of a line traced from the south New England coast west-southwest to southwestern New Mexico, thence northwestward over northeastern California, and thence inside the coast line to northwestern Washington. The highest minimum temperature, 70, was reported at Key West, Fla.; the minimum values were above 60 in extreme southern Louisiana, and were above 50 along the south Atlantic coast, over southern

portions of the Gulf States, in the Mississippi Valley to Tennessee, and in the lower Colorado valley.

#### LIMITS OF FREEZING WEATHER.

The southern limit of freezing weather is shown on Chart V by a line traced over northern New England and from northern Lower Michigan to southern Minnesota and thence to southern New Mexico. The western limit of freezing weather is shown by this line continued northwestward to the Sierra Nevada Mountain range in eastern California, thence over central Oregon, and thence over the northern Rocky Mountain region.

#### RANGES OF TEMPERATURE.

The greatest daily range of temperature is shown in the table of miscellaneous meteorological data. The greatest monthly range of temperature, 72, was reported at Dodge City, Kans.; at Miles City, Mont., the monthly range was 70. From the Rocky Mountain region the monthly ranges decreased eastward to less than 40 at points along the immediate Atlantic coast, southeastward to 20 over extreme southern Florida and extreme southern Louisiana, and to less than 30 along the Texas coast, and westward to less than 30 along the immediate middle and north Pacific coasts.

#### PERIODS OF LOW TEMPERATURE.

The month opened with temperature below freezing in the middle and northern Rocky Mountain regions. During the 2d a decided fall in temperature occurred in the lower lake region and the upper Ohio valley, and on the 3d a fall in temperature of 10 to 20 was noted in the middle Atlantic

states. A cool wave advanced from the northeast slope of the Rocky Mountains to New England from the 9th to the 13th, attended by a fall in temperature of 10 to 20. On the 22d the temperature fell 20 to 40 from the Lake region to northwestern Texas. On the 23d a fall in temperature of 20 to 30 occurred in the Lake region and Ohio Valley, and on the 24th the temperature fell 10 to 20 in the middle Atlantic and New England states.

#### FROST.

The frost line extended to north parts of the south Atlantic and east Gulf states on the 4th, 17th, 18th, and 19th. Frost was reported in central Arkansas on the 2d, 3d, and 17th. On the 1st heavy frost injured fruit and vegetables about Dodge City, Kans. Heavy frost damaged tender plants on low ground about Montrose, Colo., on the 6th. Wheat and oats were injured about Stillwater, Okla., on the 14th. On the 18th heavy frost nipped fruit buds and blossoms at Meadow Valley, Cal., and heavy frost was reported at Green Hill, Ohio. Heavy frost was reported in Washoe, Carson, and Eagle valleys, Nev., on the 21st. On the 22d heavy frost killed vegetation on low ground about Tehachapi, Cal. On the 21st frost caused considerable damage in parts of Kansas and Nebraska. Tender vegetation about Vernonia, Oregon, was nipped by frost on the 24th. On the 25th heavy frost was reported at Newbridge, Oregon, and Bear Valley, S. Dak.; at Lander, Wyo., the temperature fell to 27. Heavy frost was reported at Salt Lake City, Utah, on the 26th. Grape blossoms on low ground about Sonoma, Cal., were injured by frost on the 29th.

### PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for May, 1893, as determined from reports of more than 2,000 stations, is exhibited on Chart III. In the table of miscellaneous meteorological data the total precipitation and the departure from the normal are given for regular stations of the Weather Bureau. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

The normal precipitation for May is greatest in areas in eastern Texas and western Missouri, where it exceeds 6.00. It exceeds 4.00 over the greater part of the region extending from the middle and lower Missouri valleys to the middle and west coasts of the Gulf of Mexico, generally in Tennessee and North Carolina, and along the South Carolina and east Florida coasts. The normal amount is also in excess of 4.00 at points on the north Pacific coast, and in adjoining parts of southwestern Montana and northwestern Wyoming. In districts east of the Rocky Mountains other than those named the normal precipitation generally ranges from 2.00 to 4.00. Over the greater part of the plateau region and on the Pacific coast south of the 40th parallel the precipitation for May is usually less than 1.00, and over the west parts of the middle and southern plateau regions and southern California it is less than 0.50.

In May, 1893, the greatest monthly precipitation reported was 19.88 at Lonoke, Ark. The monthly precipitation exceeded 10.00 generally over Arkansas, central and extreme southwestern Tennessee, and in areas in the interior of the middle Gulf states. The monthly rainfall was in excess of

6.00 near the middle New England coast, in an area extending from Virginia over Missouri, Arkansas, and eastern Texas, and on the extreme north Pacific coast. In California south of the Sacramento Valley, and thence over the greater part of Nevada and southwestern Utah, the monthly precipitation was less than 0.25. Less than 1.00 fell generally over the middle and southern plateau regions, on the middle and south Pacific coasts, and in the region north of North Dakota and eastern Montana.

#### DEPARTURE FROM NORMAL PRECIPITATION.

More than the usual amount of precipitation was reported in the lower and middle Mississippi and Ohio valleys, the lower lake region, in the middle Atlantic and New England states (except in eastern Maine), over the southern plateau region, and from the north Pacific coast over the northeast slope of the Rocky Mountains; elsewhere the precipitation was deficient. The greatest excess in precipitation was noted in an area covering eastern Arkansas and adjoining parts of Tennessee and Mississippi, where the monthly amount was 6.00 to 8.00 greater than usual. In western Maine, northeastern Ohio, and northwestern Pennsylvania the monthly amount was 4.00 to 5.00 in excess of the May average. The greatest deficiency in precipitation was reported at Eastport, Me., over extreme southern Louisiana, at Dodge City, Kans., Des Moines, Iowa, and Yankton and Rapid City, S. Dak., where the monthly amount was 2.00 to 3.00 less than usual.

Considered by districts the average percentage of the normal in districts where the monthly precipitation was in excess was about as follows: southern plateau, 330; northern plateau, 176; Ohio Valley and Tennessee, 162; north Pacific coast, 147; middle Atlantic states, 140; New England, 138; lower lake region, 136; west Gulf states, 127; east Gulf states, 125; southeast slope of the Rocky Mountains, 123; and south Atlantic states, 110. In districts